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Working Paper Series

HAT Briefing Paper 5
Rolling out HATs and Creating the Market for Personal Data: The HAT Foundation

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About WMG Service Systems Group

The Service Systems research group at WMG works in collaboration with large organisations such as GlaxoSmithKline, Rolls-Royce, BAE Systems, IBM, Ministry of Defence as well as with SMEs researching into value constellations, new business models and value-creating service systems of people, product, service and technology.

The group conducts research that is capable of solving real problems in practice (ie. how and what do do), while also understanding theoretical abstractions from research (ie. why) so that the knowledge results in high-level publications necessary for its transfer across sector and industry. This approach ensures that the knowledge we create is relevant, impactful and grounded in research.

In particular, we pursue the knowledge of service systems for value co-creation that is replicable, scalable and transferable so that we can address some of the most difficult challenges faced by businesses, markets and society.

Research Streams

The WMG Service Systems research group conducts research that is capable of solving real problems in practice, and also to create theoretical abstractions from or research that is relevant and applicable across sector and industry, so that the impact of our research is substantial.

The group currently conducts research under six broad themes:

- Contextualisation
- Dematerialisation
- Service Design
- Value and Business Models
- Visualisation
- Viable Service Systems and Transformation

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HAT Briefing Paper 5
Rolling out HATs and Creating the Market for Personal Data: The HAT Foundation

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Rolling out HATs and Creating the Market for Personal Data: The HAT Foundation

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The objective of the HAT[1] is to engineer a multi-sided market / platform for personal data. Multi-sided platforms[2] (MSPs) are technologies, products or services that enable direct interactions between two or more groups of participants. Notable MSPs are Alibaba.com and eBay that enable transactions between buyers and sellers; Facebook for interactions between individuals, advertisers, content builders and game applications; Apple's iPhone and operating system for transactions between application developers and Apple users; Google's Android operating system (mobile manufacturers, application developers and users); and gaming consoles such as Sony's PlayStation and Microsoft's Xbox enabling interactions and transactions between game developers and users. Even physical spaces can be MSPs, such as retail malls enabling transactions between consumers and shops. Successful MSPs provide lower coordination, search and transaction costs for participants and therefore enable economic growth.

This briefing paper describes plans for the HAT Foundation: a group of companies that form a social enterprise to nurture, enable and regulate the HAT ecosystem needed to seed and emerge a market in personal data. The principles of the economic model as well as the HAT ecosystem and its participants are outlined in the HAT Briefing Paper 2, while the underlying technology for HAT is outlined in the HAT Briefing Paper 4[3]. This HAT Briefing Paper 5 outlines the operationalisation of the ecosystem described in the HAT Briefing Paper 2 in the form of the HAT Foundation in real-world settings, and the rationale for the institutions and structures set up to promote the health and the self-regulating and self-reinforcing nature of the HAT ecosystem.

The HAT Foundation ensures that all HAT Personal Data Platforms (HATPDPs), and interactions between HATPDPs and associated HAT Apps, conform to the HAT Code of Practice (CoP) to ensure the privacy, confidentiality, security and trust (PCST) in the use of personal data. The HAT CoP are rules for a form of exchange for personal data and other related personal data instruments (similar to a securities exchange) to be traded in the HAT ecosystem, and are detailed in the HAT Briefing Paper 3[4].

[1] To understand more about the HAT, view the HAT video (**http://hubofallthings.com/**) and the HAT presentation Prezi (**http://prezi.com/uuyigtukrgvj/?utm_campaign=share&utm_medium=copy&rc=ex0share**).
[2] For a glossary of terms and roles, please refer to the end of the document.
[3] All HAT Briefing Papers can be downloaded at **http://hubofallthings.com/hatoutputs/hat-briefing-papers/**
[4] See Footnote 3

The HAT in Brief – What Problems Does It Address?

We constantly haemorrhage personal information, to the point where we have lost control of it and get almost no real value from our data, whether from those that sell us goods and services or from the emerging "sharing economy". Turning ourselves as individuals into a "Hub-of-All-Things" (HAT) can provide a way for us to exchange our information, on our terms, for goods and services of real and direct value to us.

The HAT allows individuals effectively to broker, exchange or monetise our data to benefit ourselves. Firms (product and service providers) can also leverage this new capability for individuals because they can now provide truly personal offers.

The HAT technology enables this by providing a platform that individuals can use to integrate data across the vertical repositories – between, for example, our diary, messaging, location, finances or consumption – with applicable service timetables or catalogues. Also, firms and other organisations are then able to offer us personalised product or service offerings if given the right permissions to really understand our needs, and the context of our consumption. Individuals however may need to be prepared to allow access to some of this context where this is likely to result in better offers.

To do this, individuals need to contain, flatten, bundle and, with suitable permissions, exchange their data with other individuals, organisations or "things" within a trust framework. Equally, the commercial organisations involved need to have the same technology in place to exchange information – to receive and process personal data from individuals and potentially to share their own proprietary information with individuals.

This is what the HAT platform does in order to enable a multi-sided market for connected services and products. It addresses:

- The increasing amount of data placed on, and sourced from, the web and IoT devices – local analysis and correlation are enabled to support value exchange;
- Perception of privacy loss – less raw data is posted across the web as a result of more local analysis, and data is exchanged within a trust framework;
- Human beings do not have the computational power of corporations – with the HAT, individuals can apply corporate computing to their own "supply chains", inventory, tracking and intelligent information systems using their own data;
- Increased peer-to-peer (P2P) and crowdsourcing applications

In providing a platform that enables data containment, flattening, bundling and exchange, the HAT allows personal data to be contextualised and bundled, or integrated with other data sets in a way that is privacy-preserving and controlled by the user, so that smart individuals can benefit from crowdsourced information and better informed decision-making. The HAT will therefore have significant implications for the smart society agenda, and could become a major game changer for many societal challenges such as:

- Health, demographic change and wellbeing

- Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio-economy
- Secure, smart, clean, green and efficient energy
- Climate action, environment, resource efficiency and raw materials
- Inclusive, innovative and reflecting societies
- Secure societies – protecting freedom and security

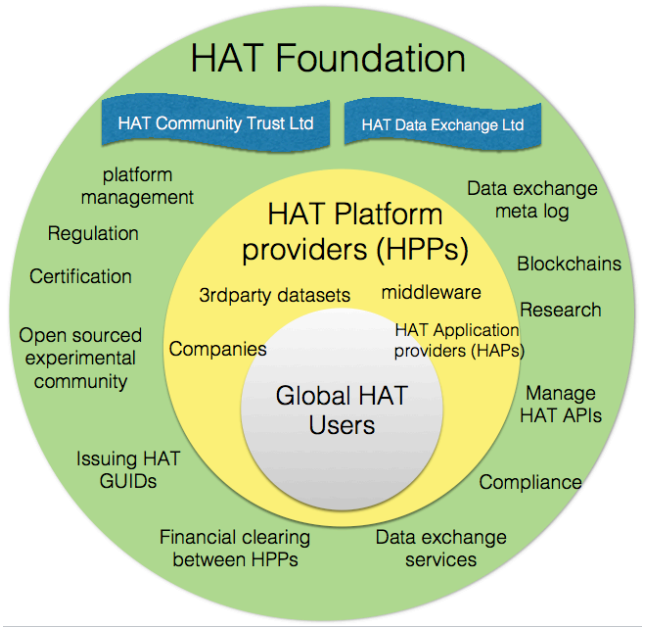
On the industry side, the Internet-of-Things (IoT) have largely evolved a collection of services that often appears to be free, but in fact makes this same trade-off. Hence, smart metering for utilities empowers the electricity-generating and grid companies to optimise their price/performance, just as a Tesco Clubcard allows the supermarket group to enhance the range and quality of its goods. What is currently somewhat different in the IoT world from the cloud world is that each of the services in the different IoT sectors is separate and exists in a silo. Hence, you cannot (easily) connect information between your smart meter, home security management, environmental control, home and in-car entertainment systems, fitness and wellbeing monitoring and control, and your social media (email, messaging, diaries, etc). Nor can suppliers do this to truly personalise their offerings for you. But the HAT can now achieve all this.

Where all websites on the Internet are connected and possibly linked, and all e-mail systems (whether web mail or traditional) are in principle inter-working, the IoT world is not, in fact, an Internet of Things – it is a collection of many disjointed networks of things, using the Internet to transfer sensor and actuator data to and from each IoT service sector's cloud service, typically offering the user a remote web API only. Does this sound familiar? It is actually pretty much like Facebook, and Google Search, which are essentially monopolies in the sectors of social networks and search respectively. Hence the IoT is not so different at one level.

At another level however it is, because no one is able to offer third-party integration of IoT services within the current structure – no one can become the Google Search+Analytics of Things. If someone could, this might be problematic in terms of risks to end-users. The HAT is therefore a fully scalable personal data platform for firms to offer individuals services for their data in a scalable way, yet at the same time allowing individuals to personalise their data according to their own needs for better decisions in their lives.

The HAT and its ecosystem (Figure 1) support four key unique value propositions by providing:

- A container – to securely store personal data;
- An ontology and database schema – allowing data to be flattened and liberated from vertical silos;
- A data bundling tool – so data can be contextualised by the individual and integrated to inform action;
- An exchange platform – a community owned for the exchange of personal information with other individuals or with firms supporting future P2P and P2B (people-to-business) services such as Blockchains.



There are many other personal data containers already available and many services that manage data in single silos, such as e-mail / communications, or diary data. But there are no known applications that flatten data to enable the contextualisation and bundling necessary to support markets based on the exchange of contextualised data.

Most importantly, the individual owns the HAT and its transformed data. However, the HAT will not enable a new MSP unless the technology is developed and used by individuals, organisations and firms within a regulated infrastructure or ecosystem. Hence the HAT Foundation will provide this regulation.

The HAT Technology

The HAT platform consists of a database schema, a data logic layer and APIs within a trust framework that enables individuals to contain, flatten, bundle and exchange all types of personal data. This in turn allows personal data to be contextualised and bundled, or integrated with other data sets in a way that is privacy-preserving and controlled by the user, so that smart individuals can benefit from crowd-sourced information and better, informed decision-making.

Equally, the HAT provides commercial organisations equipped with the same technology to receive and process personal data from individuals and potentially to share their own proprietary information with the individual, for better personalisation of their offerings.

The HAT technology, to be provided on a "freemium" basis, is an "incomplete product" – like a smartphone without any apps – on which HAT Platform Service Providers (HPPs) and HAT App Developers/Providers (HAPs) can build for public and corporate use. The HAT technology comprises:

- HAT ontology and database schema – released under a Creative Commons attribute non-derivative license and downloadable on the HAT website
- HAT APIs (Application Programming Interfaces) – routines, protocols and tools for building Apps on top of the HAT database schema
- HAT Middleware – demonstrator code to transfer data from functional input sources (currently considering whether this can, or should be made available to developers)
- HAT demonstrator platforms – currently for dot.net and Java platforms to demonstrate the HAT database and provisioning function (alpha-HAT)
- HAT hyperdata browser – an initial demonstrator on which HPPs can build:

The underlying technology for the HAT is outlined in further detail in the HAT Briefing Paper 4[5].

The HAT Business Models for HPPs and HAPs in the Commercial Ecosystem

HATs as micro-cloud servers should be available to individuals on a freemium basis, enabling a new economic model based on data exchanges that give individuals control, empowerment and independence over their data rather than having to offer it up to one of the big (data-hungry) search providers for little or no value in exchange.

The overarching principle for the HAT ecosystem is that companies will collaborate with HPPs, who are the hosts for HAT micro-cloud servers, and HAPs to make platforms and apps available to individuals on a freemium basis. These companies will generate revenue by either buying personal data or providing personalised goods and services (eg customised healthcare and well being) in exchange for data, or just by selling applications for the user to view, analyse and use their own data privately without sharing. HPPs can
also charge HAT users when data storage goes above a certain level but being mindful of the network effects, our advice to HPPs is to provide HATs for free and incentivise data exchanges as a source of revenue.

[5] HAT Briefing Papers can be downloaded at **http://hubofallthings.com/hatoutputs/hat-briefing-papers/**

HPPs also derive revenues from integrating third-party data sets and providing intermediary data services to the wider community of firms. This is, however, low-scalability revenue. Two "launch" HPPs have signed up to join the HAT ecosystem; Enable iD (**http://enableid.com)** in Europe, and Noggin Pte Ltd (**http://nogginasia.com)** in Singapore. These HPPs anticipate rolling out HATs by the end of 2015.

In order to facilitate the data exchange fundamental to the ecosystem economic model, the HPPs and HAPs will need to provide assurance that platforms and apps are compliant with a "HAT standard" on privacy, confidentiality, security and trust (PCST). There also needs to be a trusted body to facilitate financial transactions between HAT users and firms and ensure interoperability between all HAT users and firms globally. Thus, it is necessary to emerge a community-based foundation that would manage and regulate the HAT ecosystem, one that is to be funded primarily through data exchanges.

The HAT Ecosystem and HAT Foundation

To grow this technology for individuals and organisations that enables new multi-sided markets, it is crucial to have a "critical mass" of HATs "in the field" with perhaps 1-10 million initial users, before network effects can generate increasing interest and market opportunities start to develop rapidly. The HAT Project has created the HAT technology to support the new multi-sided market and designed the economic system, but an organisation is now needed to nurture and ultimately regulate the evolving HAT ecosystem: the HAT Foundation.

The HAT Foundation is the title of the social enterprise grouping to be incorporated by the HAT Project by end-November 2015, to nurture and regulate the HAT ecosystem for the benefit of HAT users and firms. It is anticipated that the HAT Foundation will consist of two "back-to-back" but independent operating entities: a Company Limited by Guarantee (CLG) – the *HAT Community Foundation* [6] – to provide overall governance and to safeguard the interests of the community as a whole, and a Company Limited by Shares – *HAT Data Exchange Ltd* – to manage, regulate and operate the ecosystem through a profit- maximising economic model. These entities can be regarded as the data exchange "Scheme Authority" and "Scheme Operator". The Scheme Operator will be limited by shares in order to attract start-up and development investment whilst remaining agile to establish the ecosystem. Figure 2 is an illustration of the tasks of the two entities and their relationships.

[6] This is a tentative name and is subject to confirmation

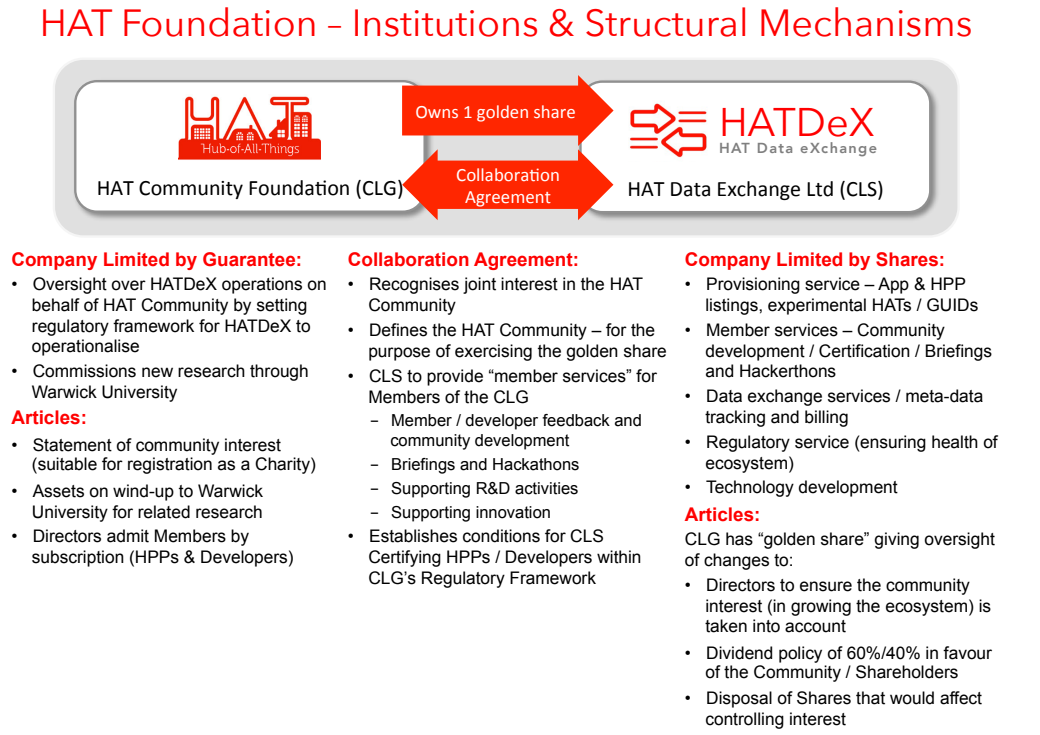


Figure 2: HAT Institutions and Mechanisms

The social objectives of the HAT Foundation will be enshrined within the Articles of Association of both entities that will require a primary focus on delivering benefits to the community of HAT stakeholders – users, firms and policy makers.

Objectives

The HAT Foundation has five main objectives:

1. Enabling the provisioning of freemium HATs to individuals worldwide by issuing and maintaining a register of unique HAT IDs through a choice of Licensed and Licensing Certified Commercial platform providers (for the hosting of their micro-cloud HATs) and developers (of the applications that sit on the HAT), thus creating the HAT ecosystem that enables individuals to exploit their personal information;
2. Enabling and supporting the open innovation (non-commercial) HAT community of innovators that downloads the free HAT Schema and database to innovate and help improve the HAT ecosystem and its technologies;
3. Regulating the HAT commercial ecosystem on behalf of the community of HAT users, developers and platform providers in terms of privacy,

confidentiality, security and trust (PCST) to facilitate healthy exchanges of personal data between parties;

4. Regulating the HAT commercial ecosystem on behalf of the community of HAT users, developers and platform providers to serve as a "financial" clearing body for transactions between HAT platforms globally that buy, rent or use personal data so that value is created for individuals and firms alike; and
5. Enabling R&D, and continuous innovation within the entire commercial and non-commercial HAT ecosystem.

Achieving the Objectives

To deliver on these main objectives, the HAT Foundation will undertake the following main functions:

1. Enable the provisioning of freemium HATs in the commercial ecosystem by providing the commercial licence of the HAT to HPPs – rolling out HATs to individuals worldwide with unique HAT IDs through a choice of licenced and certified HAT Platform Providers (HPPs)
    a. Public Listing Service - Maintain HAT*HPP and HAT*APP listings, Developer listings and manage App Catalogue
    b. Certification and issuance of Certificates to HPPs, Apps and Developers. Issuing and maintaining unique IDs for users globally (GUIDs)
    c. HAT Versioning and Updates – collating user views and comments. Commissioning new R&D and validating updates for release
    d. Meta and Open Data Services – between HAT users: logging inbound and outbound meta-data only (does not give access to the underlying data)

2. Supporting the non-commercial open-sourced HAT ecosystem through developer support and technology forums. This community is an open-sourced community and is not part of the commercial ecosystem. Apps or new technologies created on the HAT from this ecosystem will have to apply for membership with the commercial ecosystem, which would require certification and validation for privacy, confidentiality, security and trust (PCST) purposes.

3. Regulating the commercial eco-system for PCST – providing users with assurance of privacy, confidentiality, security and trust in their use of the HAT technology commercially

a. Maintaining Codes of Practice to be followed within the HAT ecosystem so that users may be assured of PCST in data exchanges
b. Defining the formal standards and requirements for the HAT technology so that HATs and HAT Apps built on it may be Certified as "PCST compliant"

4. Regulating the commercial ecosystem for value – providing a clearing body for users who wish to buy, rent or use personal data to create value from the exchange
    a. Maintaining Codes of Practice to be followed within the HAT ecosystem so that users may capture value from the exchange of data
    b. Defining the formal standards and requirements for the HAT technology so that HATs and HAT Apps built on it may be Certified as "Exchange compliant"

5. Clearing Services – acting as a clearing body for data transactions between HATs that buy, rent or use personal data for mutual benefit. Ownership of the intellectual property – promoting, maintaining and improving the HAT technology, making this freely available to all on a Creative Commons license, but regulating the roll-out of technologies joining the commercial ecosystem.

The HAT Commercial and Non-Commercial Ecosystem

A fundamental principle of the multi-sided market is that the "HAT technology" – the database schema and specification for the APIs – are open-sourced and made publicly available to encourage adoption and development by the development community and increase innovation. This understanding exists at a social-technical-economic level. In other words, it is important to continue to nurture an environment of social science, technology and economic innovators who can 'play' and develop the HAT technologies for the good of the ecosystem. This means that the HAT ecosystem exists at two levels: First, as a development and open innovation community (the non-commercial ecosystem), and second, as a commercial ecosystem with HAT users, firms and community groups.

The HAT open innovation (and non-commercial) ecosystem is able to use the HAT technologies freely for innovation and research. In order to nurture the technology and ecosystem development by the community whilst ensuring that all HATs and Apps support the ecosystem's Codes of Practice, it will be of paramount importance that innovation continues not just in the technology but in the ecosystem social, business and economics functions.

The innovations from non-commercial ecosystem have the option to develop and exploit their innovations further by applying to join the HAT commercial ecosystem. Joining the HAT commercial ecosystem would mean applying for membership into the HAT Data Exchange Ltd and offering their innovation up for certification and validation from the HAT CoP.

HAT Foundation Business Model

The HAT Foundation will need to generate income to cover operating costs and regulate the community whilst providing benefits to stakeholders.
For HAT Data Exchange Ltd (CLS), income will be derived from low and high scalable sources:

- Low scalability: Member services, training and accreditation / certification of HPPs and HAPs (through licensing of a "kite-mark"-type approach; and
- High scalability: An annual fee from each fielded HAT in active use, charged to HPPs in the commercial ecosystem. This annual fee for each active HAT provisioned by the HPP is expected to be low e.g. £1 per HAT.
- High scalability: Metadata middleware services provided to HPPs and other crowdsourced and community services.

For HAT Community Foundation (CLG), income will be from donations, grants and 20% dividend of HAT Data Exchange Ltd. This is to facilitate:

- New research and development of data exchange technology, and release of technology upgrades (to be managed on behalf of the community by Warwick University)
- Continuous improvement of the HAT's PCST capabilities, including subscription to any future Regulator for users of personal data across the Internet that may emerge
- Channeling user benefits from HAT ecosystem including, for example, subscription rebates, conferences and workshops.

Rationale for the HAT Foundation's Institutions and Structures

The market for personal data does not yet exist. To create and emerge the market, we have designed the ecosystem's institutions and structures based on the following challenges:

1. **Multi-sided stakeholder challenge**. Research into the design of the HAT ecosystem aims to emerge a market for personal data that is win-win for both firms and individuals. To demonstrate that, the HAT Foundation must therefore represent both profit-maximising private equity and social rights of individuals to access, use, control and exchange their own personal data. This means that the design of incentives (through the economic and business models) within the ecosystem must be aligned towards both wherever appropriate. If aligned appropriately, the system would then be self-reinforcing, self-regulating (except for PCST regulation) and spiraling growth will ensue. If not, conflict will occur and the ecosystem will not take off. It is therefore important that the mechanism design, including governance, equity

structures and regulatory controls be put in place at appropriate places so that the ecosystem can thrive. This is done through the following mechanisms:

- Dividend policy of HAT Data Exchange Ltd (HATDeX) is proposed at 40/40/20 where a 40% dividend would be returned to private shareholders, a 40% dividend to all HAT users of the ecosystem through a membership scheme or data cryptocurrency scheme approved by the HAT Community Foundation (HCF) and a 20% dividend would be given to HCT for R&D purposes. Such a dividend policy reinforces the social enterprise nature of the HAT Foundation that promotes innovation and individuals' interests.
- One golden share of HATDeX is owned by HCF. This means HCF has the veto right for important decisions such as dividend policy (40/40/20), controlling interests, directorships and oversight of the PCST regulatory implementation/operationalisation. From the perspective of private shareholders, the understanding that HATDeX share valuations would be discounted by 60% due to the dividend policy means that they are aware from the outset what the social and financial obligations of HATDeX are before investing.

2. **PCST challenge**. There needs to be privacy, confidentiality, security and trust in the ecosystem. If the HAT Foundation is purely for-profit, HAT users would be skeptical of its role as a trust broker. However, if the HAT Foundation is purely non-profit, it would not be able to raise enough funding to start it off and scale it up, nor would it have an incentive to grow a steady revenue to upkeep the health of the ecosystem. It is therefore necessary to have a hybrid funding system and to design incentives such that community interest and private equity interest can be aligned, but that one does not marginalise the other. The HAT Foundation structure of a CLS and CLG means that HATDeX can operate as a profit-maximising firm, regulated by HCT, which is a community interest company. It also means that when HATDeX is profitable, the HCT will benefit as well – from the dividend policy of 20% towards R&D and 40% towards HAT users through a membership scheme. A dividend policy was chosen instead of equity, so that its potential revenues would not be diluted.

3. **Scale Challenge**. The HAT ecosystem needs to be scaled. That means the ecosystem needs to grow to 1 million HATs within a year. Only when numbers are high and there is network effects, will there be true power for individuals to have a say in the way they exchange their own data. To scale the ecosystem quickly, there needs to be private equity on one hand, and on

the other, crowdsourced funding to lead and inspire a large global social movement. To do this, the institutions and structures of the HAT Foundation need to be put in place properly and transparently and to show that this is a genuine and serious social movement, The companies put in place within the HAT Foundation also need to have the governance and equity structure that reflect the genuine intentions of the founders and the members of the social movement.

Delivering on emerging a market for personal data based on the HAT value propositions will enable individuals and firms to engage in new ways, to create new markets, with new economic and business models based on the controlled exchanges of contextualised personal data. This will only work if the HAT Foundation is structured in a way that is win-win for firms and individuals. This briefing paper has outlined the institutions and mechanisms that would be created for the HAT ecosystem, based on research within the HAT team. As the HAT is a research project on economic and business models in the digital economy, the team is quite aware that the proof of our efforts will only come when a self-reinforcing and spiraling growth of the HAT ecosystem is achieved and a market for personal data becomes a reality.

Glossary of Terms

App(s)	***HAT Applications*** developed to work in conjunction with *HATs / HATPDPs* to provide a *HAT Service*
API	Application Programming Interface
The HAT	A personal data platform developed by the *HAT project* that allows a HAT user to acquire, store, transform, view, sell, rent, trade and use his or her personal data. Also known as the HAT Personal Data Platform (HATPDP)
HAP	**HAT Application Provider -** A HAT *Service Provider* that develops Apps for the HAT. Also referred to as HAT App Developer
HAT App Market	A Marketplace of HAT applications where HAT users can buy or download to visualise, analyse or use their data
HAT CoP	***HAT Code(s) of Practice*** – a set of practices to which all HAT participants subscribe. Provides assurance of privacy, confidentiality, security and trust *(PCST)* in data transactions, and in the authenticity / voracity / value of the data instruments transacted
HAT Data	Data from *HAT-ready Devices* and services which the individual has access to that is acquired into the user's own HAT
HAT Developers	Individuals who create HAT services who could be working for *HAT Service* providers
HAT Foundation	The social enterprise grouping that will nurture and regulate the *HAT ecosystem* based on the open-sourced *HAT technology*
HAT Ecosystem	The community of all the individuals, firms and other organisations engaged in using the open source *HAT technology,* regulated by the *HAT Foundation* to be compliant with the *HAT CoP (Code(s) of Practice)*
HAT Hyperdata Browser	A 'browser' of how data is linked to other data in other places and a way to view the linkages and clusters of data

HAT Participants	*HAT Developers, HPPs, HAPs, HAT Users, HAT Service Providers*
HATPDP	**HAT Personal Data Platform** – an individual's own, registered, micro-cloud data platform that operates in compliance with the *HAT Code(s) of Practice.* Also referred to as the HAT
HAT Project	The £1.2m RCUK Digital Economy-funded project of 6 universities led by WMG, University of Warwick that has demonstrated the multi-sided market for personal data and the HAT technology to enable it. Evolved into the *HAT Foundation* as a social enterprise that will nurture and regulate the *HAT ecosystem*
HAT-ready Device	A device that is able to send and / or receive data to / from the HAT in a way that is compliant to *HAT CoP* and certified by the *HAT Project*
HAT-ready Service	A service that is able to send and / or receive data to / from the HAT in a way that is compliant to *HAT CoP* and certified by the *HAT Project*
HAT Service	A service that runs on the HAT at all levels (platform, user, middleware etc.)
HAT Service Providers	Organisations who provide a *HAT Service* on the *HATPDP*
HAT Technology	The collection of open-source technical assets needed to build *HATs* and *HAT Apps* (as defined in the main paper)
HAT User	An individual who owns and uses *HAT Data* and integrates data from *HAT-ready Devices* and *Services*
HPP	**HAT Platform Provider -** An organisation that hosts users' micro-cloud HATs and supports a community of *HAT Developers* by developing *HAT services* that improve the *HATPDP* capabilities
PCST	Privacy, confidentiality, security and trust (in data exchanges)
MSP	**Multi-Sided Platform(s)**

Roles on the HAT Ecosystem

HAT User

Description: An individual who owns and uses HAT data and integrates data from their HAT-ready devices and services

Functions:

1. Users register with a HATPDP Provider for a HAT
2. Users are given a unique HAT ID
3. Users authenticate their identity and access to their HATPDP Provider
4. Users acquire data from HAT device(s) and service(s) onto their HAT
5. User personalises their HAT through bundles or collections
6. Users lookup and check personal data on their HAT
7. Users can create an event and decide what HAT data is relevant to the event
8. Users can track their HAT data
9. Users can export their HAT data for sharing or to be used, bought or rented by third parties through the D3 system
10. User can see their list of D3s and transaction history
11. User can control their D3 system rules such as cancelling or modifying a D3

HAT App Developer (HAP)

Description: Developers who create HAT services

Functions

1. Develops HAT services that enable the sharing, buying, renting or operating of user applications on HAT data
2. Maintains working version of the HAT services
3. Provides regular software patches and updates to maintain the HAT services
4. Notifies the HPP when the HAT services are changed or deleted from use

HATPDP Provider (HPP)

Description: A platform provider that hosts users' HATs and supports a community of HAT developers by developing middleware capabilities

Functions:

1. Defines the level that the HPP will operate the HAT database and service for a HAT user
2. Provides users with a HAT environment.
3. Ensures security of data on behalf of the HAT user
4. Ensures confidentiality of data through access control

5. Validates the service rules for event creation and data debit generation with the compliance of the user
6. Validates the data debit privacy rules
7. Validates data debit usage rules
8. Enforces the service rules and usage rules to enforce the privacy requirement

Hub-of-all-Things (HAT) Research Team (incorporating the HARRIET team)

The Investigators

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